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10/526,145	10/14/2005	Sunil C. Shah	VOY-038US	2524
37694 7590 05/28/2009 WOOD, HERRON & EVANS, LLP (TOKYO ELECTRON) 2700 CAREW TOWER 441 VINE STREET CINCINNATI, OH 45202				
EXAMINER				
BARON, HENRY				
ART UNIT		PAPER NUMBER		
2416				
NOTIFICATION DATE		DELIVERY MODE		
05/28/2009		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/526,145

Applicant(s)

SHAH ET AL.

Examiner

HENRY BARON

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☒ Claim(s) 8-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

Detailed Action

METHOD AND SYSTEM FOR SPLIT-PAIR RECEPTION IN TWISTED-PAIR COMMUNICATION SYSTEMS

Response to Arguments/Remarks

1. Claims 1 – 10 are pending in the application. Claims 2 – 10 are new.
2. Applicant's arguments filed 12/22/2008 have been fully considered but they are not persuasive.
3. Applicant argues that though Applicant discloses the same basic configuration as Cioffi, Cioffi does not disclose of introducing a split-pair or any other receiver, which may be used to mitigate crosstalk between pairs of transmission lines as disclosed and claimed in embodiments of Applicant's invention as in new claim 2. Applicant also argues that the MIMO processing disclosed in Ginis can be used with the crosstalk cancellation of Cioffi in order to further reduce crosstalk on the transmission pair and is similar to Applicant's claimed invention, but again, does not disclose of introducing a split-pair or any other receiver as in new claim 2.
4. Examiner replies that the rejections made were to the then pending claims. Furthermore, that split-pair receivers are used within the art, as cited below to inductively couple interfaces under different configurations. Examiner objects to claims 8 – 10 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:
 - a. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cioffi, et al (U.S. Patent 5887032), hereafter Cioffi, in view of in view of Ginis et al (U.S. Patent 7158563) hereafter Ginis.

7. In consideration of claim 1, Cioffi teaches a method for reducing signal distortion in a multiple line transmission system, the method comprising: using one or more split-pair receivers in a multilinear communications system to identify crosstalk on a pair of transceivers coupled to the split pair receivers, (3: [0044] read [a]s a crosstalk interference canceller for mitigating crosstalk interference induced by signals on a first line onto signals on a second line, .. an adaptive filter i.e. split pair receiver, for producing a crosstalk cancellation signal based on estimated coupling coefficients between the first line and the second line at predetermined frequencies and based on signals on the first line at the predetermined frequencies;) where each split pair receiver receives a signal including the crosstalk from each transceiver (2: [0012] read the processing i.e. a post processing unit, and distribution unit 104 services a multiplicity of discrete subscriber lines 112-1 through 112-n. Each subscriber line 112 typically services a single end user.) and provides a corresponding signal vector to a post processing unit; (3: [0044] read .. a subtractor for subtracting the crosstalk cancellation signal from the signals on the second line to produce a modified signal on the second line i.e. provides a corresponding signal vector to a post processing unit, the modified signal thereby having any crosstalk interference from the first line mitigated)

8. However, Cioffi does not disclose performing MIMO post-processing on signal vectors received at a receiver from each transceiver and each split-pair receiver while minimizing crosstalk on pairs of lines in the multiline communications system with a frequency equalizer,

9. Ginis teaches these limitations, in particular performing MIMO post-processing on signal vectors received at a receiver from each transceiver and each split-pair receiver while minimizing crosstalk on pairs of lines in the multiline communications system with a frequency equalizer. (21: [0051] read ..

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preferred MIMO precoder described above corresponds to a single tone and is shown in FIG. 13.

Combining the precoders of all tones and including the DMT transmitters and receivers, the vectored DMT system for downstream transmission is shown in FIG. 14 i.e. performing MIMO post-processing on signal vectors received at a receiver from each transceiver.)

10. It would have been obvious at the time the invention was made by a person of ordinary skill in the art to modify the signal distortion in a multiple line transmission system teachings of Cioffi with the MIMO post-processing teachings of Ginis.

11. In this manner for a digital communication systems where the transmission medium consists of twisted pairs copper wiring (e.g. Digital Subscriber Line (DSL) systems, ISDN, HDSL, ADSL and VDSL, and Local Area Networks (LAN), such as Ethernet), where cross-talk is prevalent both as near-end crosstalk (NEXT) and far-end crosstalk (FEXT) interference, the spurious signals produced by these signals can be mitigated using a split-pair receiver to increase the dimension of the signal space used advantageously for crosstalk mitigation in the multiline system.

12. Claims 2 – 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cioffi, et al (U.S. Patent 5887032), hereafter Cioffi, in view of in view of Ginis et al (U.S. Patent 7158563) hereafter Ginis and in further view of Curry (U.S. Patent 6379157)

13. With regards to claims 2, Cioffi modified teaches the limitations of claim 1, but does not disclose connecting a first input of a first split-pair receiver to a tip of a first transceiver of the pair of transceivers; connecting a second input of the first split-pair receiver to ring of a second transceiver of the pair of transceivers; and connecting an output of the first split-pair receiver to the post processing unit.

14. Curry teaches of connecting a first input of a first split-pair receiver to a tip of a first transceiver of the pair of transceivers; connecting a second input of the first split-pair receiver to ring of a second transceiver of the pair of transceivers; and connecting an output of the first split-pair receiver to the post processing unit. (10: [0012] read As found in conventional connectors, pairs of "tip" and "ring" wires

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found in the conventional communication plug connector 40 are oriented to mutually couple magnetic flux to generate inductive coupling between the pairs. Typically, two pairs of wires, in particular, the center pair having the center "tip" wire 30a i.e. to a tip of a first transceiver of the pair of transceiver and the center "ring" wire 30b i.e. connecting a second input of the first split-pair receiver to ring of a second transceiver and the split pair i.e. connecting a first input of a first split-pair receiver having the split "tip" wire 34a and the split "ring" wire 34b are found to significantly contribute to crosstalk generated by mutual inductance. Both center and split pairs of wires found in the communication plug connector 40 have inductive coupling with a negative polarity and thus, to compensate, inductive coupling with a positive polarity is added to the compensating jack connector 100.)

15. It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify the teachings of Cioffi with the split-pair receiver teachings of Curry.

16. In this manner, noise can be reduces as the added inductive coupling can reduce crosstalk on signals.

17. With regards to claim 3, Cioffi modified teaches the limitations of claim 2, but does not disclose connecting a first input of a second split-pair receiver to a ring of the first transceiver of the pair of transceivers; connecting a second input of the second split-pair receiver to a tip of the second transceiver of the pair of transceivers; and connecting an output of the second split-pair receiver to the post processing unit.

18. Curry teaches of connecting a first input of a second split-pair receiver to a ring of the first transceiver of the pair of transceivers; connecting a second input of the second split-pair receiver to a tip of the second transceiver of the pair of transceivers; and connecting an output of the second split-pair receiver to the post processing unit. (10: [0055] read A third layer, Layer C, comprises additional wire traces including split "tip" wire trace 134a and split "ring" wire trace 134b i.e. a first input of a second split-pair receiver to a ring of the first transceiver of the pair of transceivers that are electrically coupled

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through the contact members 114 to the split "tip" wire 34a and the split "ring" wire 34b of the communication plug connector 40. i.e. connecting an output of the second split-pair receiver to the post processing unit.)

19. It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify the teachings of Cioffi with the split-pair receiver teachings of Curry.

20. In this manner, noise can be further reduced as the added inductive coupling can reduce crosstalk on signals.

21. With regards to claim 4, Cioffi modified teaches the limitations of claim 1, but does not disclose connecting a first input of a first split-pair receiver to a ring of a first transceiver of the pair of transceivers; connecting a second input of the first split-pair receiver to a ring of a second transceiver of the pair of transceivers; and connecting an output of the first split-pair receiver to the post processing unit.

22. Curry teaches by symmetry of connecting a first input of a first split-pair receiver to a ring of a first transceiver of the pair of transceivers; connecting a second input of the first split-pair receiver to a ring of a second transceiver of the pair of transceivers; and connecting an output of the first split-pair receiver to the post processing unit. (10: [0012] read As found in conventional connectors, pairs of "tip" and "ring" wires found in the conventional communication plug connector 40 are oriented to mutually couple magnetic flux to generate inductive coupling between the pairs. Typically, two pairs of wires, in particular, the center pair having the center "tip" wire 30a i.e. to a tip of a first transceiver of the pair of transceiver and the center "ring" wire 30b i.e. connecting a second input of the first split-pair receiver to ring of a second transceiver and the split pair i.e. connecting a first input of a first split-pair receiver having the split "tip" wire 34a and the split "ring" wire 34b are found to significantly contribute to crosstalk generated by mutual inductance. Both center and split pairs of wires found in the communication plug connector 40 have inductive coupling with a negative polarity and thus, to compensate, inductive coupling with a positive polarity is added to the compensating jack connector 100.)

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23. In regards to claim 5, Cioffi teaches of a multiline communication system for reducing signal distortion, the system comprising: a first and second pair of lines in the multiline communication system; (3: [0044] read [a]s a crosstalk interference canceller for mitigating crosstalk interference induced by signals on a first line onto signals on a second line, .. an adaptive filter i.e. split pair receiver, for producing a crosstalk cancellation signal based on estimated coupling coefficients between the first line and the second line at predetermined frequencies and based on signals on the first line at the predetermined frequencies;) a first and second transceiver electrically connected to the corresponding first and second pair of lines; a split-pair receiver electrically connected to a line of the first pair of lines and a line of the second pair of lines and configured to identify crosstalk on the first and second transceivers; (2: [0012] read the processing i.e. a post processing unit, and distribution unit 104 services a multiplicity of discrete subscriber lines 112-1 through 112-n. Each subscriber line 112 typically services a single end user i.e. first and second transceiver electrically connected to the corresponding first and second pair of lines;)

24. However, Cioffi does not disclose performing MIMO post-processing on signal vectors received at a receiver from each transceiver and each split-pair receiver while minimizing crosstalk on pairs of lines in the multiline communications system with a frequency equalizer,

25. Ginis teaches these limitations, in particular performing MIMO post-processing on signal vectors received at a receiver from each transceiver and each split-pair receiver while minimizing crosstalk on pairs of lines in the multiline communications system with a frequency equalizer. (21: [0051] read .. preferred MIMO precoder described above corresponds to a single tone and is shown in FIG. 13. Combining the precoders of all tones and including the DMT transmitters and receivers, the vectored DMT system for downstream transmission is shown in FIG. 14 i.e. performing MIMO post-processing on signal vectors received at a receiver from each transceiver.)

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26. However Ginis does not disclose post-processing on signal vectors received at each transceiver of the pair or transceivers and the split-pair receiver, wherein the split-pair receiver receives a signal including the crosstalk from the first and second transceivers and provides a corresponding signal vector to the post-processing unit, and wherein the post processing unit is further configured to minimize crosstalk on the first and second pair of lines in the multiline communication system with the frequency equalizer.

27. Curry teaches of connecting a first input of a first split-pair receiver to a tip of a first transceiver of the pair of transceivers; connecting a second input of the first split-pair receiver to ring of a second transceiver of the pair of transceivers; and connecting an output of the first split-pair receiver to the post processing unit. (10: [0012] read As found in conventional connectors, pairs of "tip" and "ring" wires found in the conventional communication plug connector 40 are oriented to mutually couple magnetic flux to generate inductive coupling between the pairs. Typically, two pairs of wires, in particular, the center pair having the center "tip" wire 30a i.e. to a tip of a first transceiver of the pair of transceiver and the center "ring" wire 30b i.e. connecting a second input of the first split-pair receiver to ring of a second transceiver and the split pair i.e. connecting a first input of a first split-pair receiver having the split "tip" wire 34a and the split "ring" wire 34b are found to significantly contribute to crosstalk generated by mutual inductance. Both center and split pairs of wires found in the communication plug connector 40 have inductive coupling with a negative polarity and thus, to compensate, inductive coupling with a positive polarity is added to the compensating jack connector 100.)

28. It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify the teachings of Cioffi modified with the split-pair receiver teachings of Curry.

29. In this manner, noise can be reduced as the added inductive coupling can reduce crosstalk on signals in a system for split-pair MIMO reception using twisted-pair wires.

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30. With regards to claim 6, Cioffi modified teaches the limitations of claim 5, but does not disclose a first and second analog front end circuit electrically connected to the respective first and second pair of lines in the multiline communication system and the respective first and second transceivers.

31. Curry teaches a first and second analog front end circuit electrically connected to the respective first and second pair of lines in the multiline communication system and the respective first and second transceivers. (See FIG. 1B is a schematic diagram illustrating a conventional technique for transmission of communication signals using differential circuitry and a twisted pair wire cable.)

32. It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify the teachings of Cioffi modified with the analog front end teachings of Curry.

33. In this way, analog front end circuitry that can be used in a manner of design where noise can be mitigated and crosstalk reduced.

34. With regards to claim 7, Cioffi modified teaches the limitations of claim 5 and where the first and second pair of lines comprise a twisted pair (1: [0024] read Bi-directional digital data transmission systems are presently being developed for high-speed data communication. One standard for high-speed data communications over twisted-pair phone lines i.e. where the first and second pair of lines comprise a twisted pair that has developed is known as Asymmetric Digital Subscriber Lines (ADSL.) , but does not disclose of copper lines.⁹³

35. Curry teaches of using copper lines (13: [0004] read the PC board shown in FIG. 5 comprises first and fourth wire trace layers 150 and 166 made from 1.5 oz finished copper, second and third wire trace layers 156 and 160 made from 2.0 oz finished copper.)

36. It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify the teachings of Cioffi modified with the copper conductor teachings of Curry.

37. In this manner the signal can generated with a economical, ubiquitous, and efficient conductor.

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38. The system of claim 5, wherein the line of the first pair of lines is a transmitting line and the line of the second pair of lines is a transmitting line.

Allowable Subject Matter

39. Claims 8 – 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

40. The basis for allowance is the limitation is that none of the prior art references teach of where the line of the first pair of lines is a receiving line and the line of the second pair of lines is a transmitting line or wherein the line of the first pair of lines is a transmitting line and the line of the second pair of lines is a transmitting line. Further, none of the prior art discloses a first split pair receiver and a second split-pair receiver electrically connected to a receiving line of the first pair of lines and a transmitting line of the second pair of lines, where the first split-pair receiver is electrically connected to a transmitting line of the first pair of lines and a receiving line of the second pair of lines.

Conclusion

41. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY BARON whose telephone number is (571)270-1748. The examiner can normally be reached on 7:30 AM to 5:00 PM E.S.T. Monday to Friday.

42. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on (571) 272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

43. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair->

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direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. B./
Examiner, Art Unit 2416
HB

/Kevin C. Harper/

Primary Examiner, Art Unit 2416